Для проведения экспериментов были освоены различные технологии загрузки, которые позволят в ближайшее время сделать все вышесказанные эксперименты.

Существует множество способов получения НП. Одним из которых является облучение наночастиц на ускорителе электронов. Порошки, которые будут исследоваться получены этим способом.

Данное направление исследования является в биомедицине одним из перспективных, так как позволяет получить комплексное действие композита, которым в работе является Al2O3, и серебра, что влияет на биоэффективность.

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EVALUATION OF THE DOSIMETRIC PARAMETERS FOR 252CF DURING INTERSTITIAL BRACHYTHERAPY OF HEAD AND NECK ORGANS

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Dosimetric calculations of the main parameters of interstitial brachytherapy of the head and neck organs with the 252Cf source were performed. 10 cases of low-power brachytherapy were analyzed. The concept of precision modeling of the interstitial brachytherapy scenario is formulated.

Treatment of malignant neoplasms of the head and neck is an actual problem in the worldwide. The method of interstitial brachytherapy using needle sources 252Cf allows to destroy of malignant cells in the head and neck. This isotope has its origin since 1970, when the whole world was interested in the use of this source for therapeutic purposes and not only.

The fission and decay of a nuclide is accompanied by the emission of neutrons (3.1 %), alpha-particles (96.9%), β-particles, x-ray and gamma radiation [1]. One of the most important characteristics of 252Cf is its effective half-life - 2,646 years. During interstitial brachytherapy, the main contribution to the dose is made by neutron and gamma radiation. The value of the average neutron energy is 2.35 MeV. The average energy of y-radiation is 1 MeV [1].

The technique of interstitial brachytherapy of the head and neck organs is performed using the Paris system [2]. According to this system, radioactive sources are distributed in one plane, or in two parallel planes. Sources must have the same linear density, located in the tissues parallel to each other and at equal distances. Based on

this, special schemes for placing needle sources were introduced – triangle, square, 2 square and ellipse. Strict adherence to the rules of the system guarantees a uniform average dose throughout the target volume. The dose drop does not exceed ±10 %.

In the period from January 2018 to May 2018, 10 patients were treated with interstitial brachytherapy at the Medical Radiological Research Center named after A. F. Tsyb. For 6 patients, the ellipse scheme was chosen, for the other 4 patients – "2 square". The dose chosen by the doctor for the neutron component was 8 Gy in all 10 cases. As mentioned above, the main contribution is due to the neutron and gamma components, but when planning and determining the therapeutic dose – the gamma radiation is not considered.

In this work, we analyzed the main parameters of the gamma component in interstitial brachytherapy, namely: the dose rate, the dose rate at the reference point and the total dose received by the gamma component. At a therapeutic dose of 8 Gy by neutron radiation, about 4-5 Gy comes from gamma radiation, which is quite significant.

For further evaluation of gamma radiation, the task of modeling the scenario of interstitial brachytherapy using the transport code – MCNP [3] was set. A voxel phantom of the head – "Zubal Phantom" (Fig. 1) [4] was chosen as the object of precision irradiation.

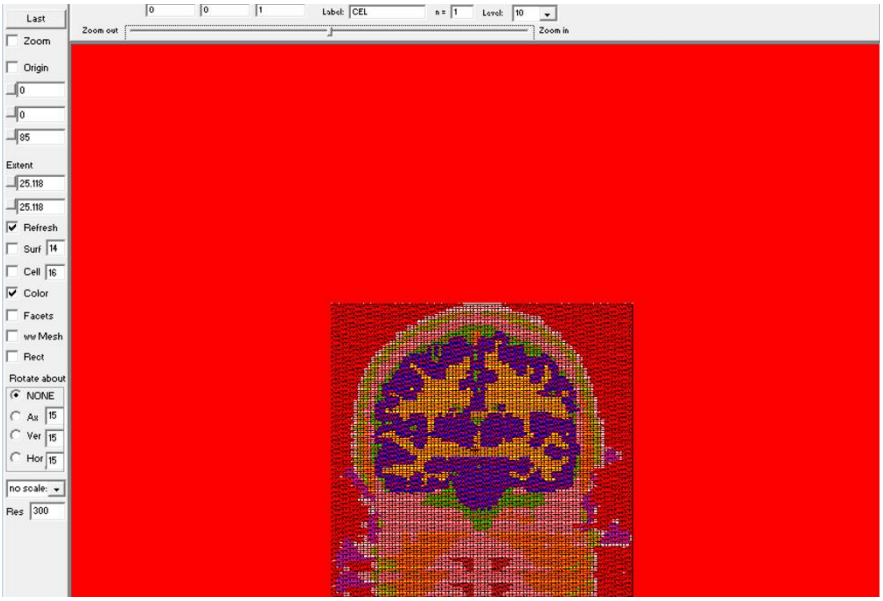

Fig. 1. The voxel phantom of the head "Zubal".

During the study, it is planned to evaluate the contribution of neutron and gamma radiation to the tumor area and obtain the values of the absorbed, equivalent and effective dose. Also, evaluate the dose received on critical organs and tissues.

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